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DRAWINGS ATTACHED.

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1,090,891

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COMPLETE SPECIFICATION.

Improvements in the Control of Lighting for Variable Effect.

We, THE STRAND ELECTRIC & ENGINEERING CO. LTD., a British Company, of 29 King Street, London, W.C.2, and FREDERICK PERCY BENTHAM, a British subject, of 24 Amherst Road, Ealing, London, W.13, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to apparatus for the control of lighting for variable effect such as is employed for the lighting of theatre stages and television studios.

In the lighting of television studios, for example, there is provided a large number of lighting circuits each including a dimmer individual thereto by means of which the intensity of light given by a lamp or lamps in the circuit can be varied to give a variable lighting effect of a scene being televised. Operation of the dimmers is effected under the control of miniature dimmer levers mounted in a remote panel or console, there being at least one lever for each lighting circuit. Each dimmer lever is movable over a scale graduated from no light to full light and the position of the lever on the scale therefore gives an indication of the condition of the dimmer controlled thereby and thus the intensity of light given by the associated lighting circuit.

One set of light intensities or colours is required to follow another set with the dimmers differently adjusted to give a change of lighting effect. The changes may be gradual or rapid and in either case a number of dimmers will have to be readjusted simultaneously. Complete changes of lighting effect may also be required to correspond with a change of scene.

In television studios there may be several scenes ranged around the studio and the actors and television cameras visit the scenes in turn, or a very large scene may occupy the studio and parts of the scene are viewed in turn and the programme may cover a large number of scenes or of such parts of a scene not necessarily in strict sequence. The method hitherto adopted to cover these various changes is known as multi-scene preset and requires the provision of a plurality of dimmer levers common to each lighting circuit, ten such common levers being quite usual. This number of levers necessitates making the levers very small, in order to avoid the control panel or console becoming too large but at the same time they become difficult to operate. Furthermore, the provision of ten levers to each lighting circuit has in many cases been found inadequate and even larger numbers have to be contemplated, but it is difficult to provide conveniently enough sets of levers to correspond to the number of changes of light intensity required and which have to be reset to fresh intensities once they have been operated to give a desired lighting arrangement. This involves the provision of a written plot of the dimmer levels and circuits for each lighting change.

It is a feature of television production that although time may exist for the preparation and planning of the lighting changes before the production arrives in the studio, actual studio time is very limited. However, the dimmer intensity levels can only be set in the studio when the scenery, actors and lighting are rehearsed and viewed on the monitors which show the results as seen by the cameras. There is therefore unlikely to be sufficient time to write carefully a plot which

will enable desired results established at the rehearsal to be repeated exactly for the final run-through and transmission. Analysis of common lighting plots shows that each dimmer does not have to take up a large number of levels but a large number of preset control levers are required in order to provide for differing combinations with other dimmers.

However, providing that the dimmer levers can be switched or faded simultaneously with the levers of the group of lighting circuits which are required to change in order to give a desired lighting effect, only two dimmer levers to each dimmer may be sufficient if provision is made for instant switch selection of a number of individually regulated dimmers and by providing a master dimmer control common to the selected individual dimmers whereby the lighting circuits controlled thereby can be faded-in at a desired rate by operation of the master control.

According to the present invention apparatus for controlling lighting to produce a variable effect comprises a plurality of control potentiometers each of which controls the setting of a dimmer of one of a plurality of lighting circuits, a master control potentiometer and means for connecting any selected number of the control potentiometers to the master control potentiometer and for subsequently simultaneously transferring the potentiometers so selected to an alternative source of current leaving the master control potentiometer available for connection of further control potentiometers. In this manner, after fading in a group of circuits by means of the master control potentiometer, the circuits can be transferred or "parked" on to the alternative source of current thereby leaving the master control potentiometer free for fading-in a further group of circuits, the light intensity of the parked circuits being determined by the setting of the respective individual control potentiometers.

According to a further feature of the invention the said alternative source of current includes a second master control potentiometer so that the "parked" lighting circuits can be faded-in by means of the second master control.

The invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a simplified circuit diagram illustrating the basic principle of the invention.

Figs. 2 and 3 show in front elevation a dimmer control panel and an associated master and memory panel respectively of one embodiment of the invention, and

Fig. 4 is a circuit diagram of the apparatus of Figs. 2 and 3.

Referring firstly to Fig. 1, there is shown at 1 a dimmer control potentiometer adjustable by means of a suitable dimmer lever (not shown) for controlling over a lead 2 the setting of a dimmer of a lighting circuit, and at 3 a similar control potentiometer for controlling over lead 4 the setting of the dimmer of a second lighting circuit.

A first master potentiometer 5 is adapted to be connected in series with one or the other control potentiometer 1 or 3 by means of a selector switch associated with each control potentiometer. Only the contacts of each selector switch are shown in the broken line rectangles 6 and 6^1, it being understood that the switches may be operated manually as by a push button, for example, or electrically from a memory store.

A second master potentiometer 7 is also adapted to be connected in series with either one of the control potentiometers by means of relays 8 and 8^1 associated respectively with the control potentiometers 1 and 3. The relays 8 and 8^1 are double coil relays having a single contact which is closed or opened upon energisation of one coil or the other, the contact remaining in the position to which it is switched. Associated with each master potentiometer is a normally open switch shown as a push button 9, the push buttons 9 being connected respectively through separate contacts of the selector switches 6 and 6^1 to one coil of each of the relays 8 and 8^1.

In Fig. 1 the selector switch 6^1 of the control potentiometer 3 is shown closed indicating that this control has been selected, the other selector switch 6 being in the open position. The circuit of the control potentiometer 1 is thus open at the released contact 10 of selector switch 6 while the control potentiometer 3 is energised from the master potentiometer 5 through closed contact 10^1 of selector switch 6^1 and diode 11, and the lighting circuit controlled by the potentiometer 3 can be faded-in by operation of the master potentiometer 5.

When it is required to select the control potentiometer 1, it is first necessary to transfer or "park" the already selected control potentiometer 3 on to the master potentiometer 7. This is effected by closing the push button switch 9 associated with the master potentiometer 7 thereby to complete a circuit for the coil 17 of relay 8^1 through the closed contact 16 of selector switch 6^1. The relay 8^1 operates and closes its contact thereby completing a circuit from the master potentiometer 7, closed contact of relay 8^1, and diode 14 to the control potentiometer 3 which is then in series with the master potentiometer 7. The control potentiometer 3 is then de-selected by releasing the selector switch 6^1 which at its contact 10^1 opens the circuit from the master potentiometer 5. In order to re-

transfer the control potentiometer 3 to the master potentiometer 5, the selector switch 6^1 is again operated and the push button switch 9 associated with the master potentiometer 5 is operated. This completes a circuit through contact 13 of selector switch 6^1 and winding 12 of relay 8^1 which operates to open its contact and disconnect the control potentiometer 3 from the master potentiometer 7, the control potentiometer 3 remaining connected to the master potentiometer 5 over the closed contact 10^1 of selector switch 6^1.

The control potentiometer 1 is then selected by operating the selector switch 6 which closes its contact 10 and connects the master potentiometer 5 in series with the diode 15 and the control potentiometer 1 so that the master potentiometer 5 effects an overriding control of the dimmer of the lighting circuit controlled by the control potentiometer 1.

It will be understood that in practice there will be more than one control potentiometer associated with the dimmer of each lighting circuit and by operation of the appropriate selector switches the control potentiometers can be connected in groups to the master potentiometer 5 or can be parked on the master potentiometer 7.

Conveniently each individual dimmer has a pair of dimmer control potentiometers, a pair of selector switches, and a pair of indication pilot lamps. The pairs represent two sets of independent controls for the same set of dimmers and are known as preset A and preset B respectively. The circuit selector switches may take the form of the known organ stopkey type switching device adapted for individual manual selection and group combination action. The groups are selected in known manner by a miniature switchboard or more conveniently by an automatic switchboard or other memory store such as a magnetic drum or matrix capable of memorising the combinations required and recalling them by moving the stopkey on or off when the requisite combination push button is operated. In this manner it is possible to preselect any of the selector switches and by operation of a push-button to open or close all those which are preselected simultaneously.

Using the preset A or preset B selector switches the individual dimmer control potentiometers can be connected to the preset A or the preset B busbars, or both. These busbars are fed from a master potentiometer which can be made to vary the potential over the range of dimmer control represented by no light to full light. Associated with each preset is a second busbar AX and BY respectively controlled from similar master potentiometers. The procedure is normally to keep the AX and BY master potentiometers at the full-on light position and the A and B preset master potentiometers at the off—no light position. Selection is made by hand or combination device on, for example, preset A and the individual A preset dimmer potentiometers are regulated as determined by the nature of lighting effect to be produced. The master potentiometer is moved to full-on at the rate required and when at full-on, a transfer push button can be operated to changeover to the AX master potentiometer, indication of the dimmers changed over being shown by associated pilot lights. The A preset can then be used for a fresh combination of dimmer control potentiometers which in turn can be transferred to the AX master potentiometer. Some or all of the dimmer control potentiometers transferred to the AX master potentiometer can subsequently be re-connected to the A preset master potentiometer by selecting them and using an appropriate transfer push button. Alternatively all or some of the dimmer control potentiometers transferred to the AX master potentiometer can be left connected therewith and faded out using the AX master potentiometer. Preset B provides a second set of dimmer intensities to be selected in the same way as above described for preset A.

There will be times when a group of dimmers has been selected in readiness for a subsequent operation and it is necessary to perform an action in respect of a single circuit or a number of single circuits without disturbing the selection already made. For this purpose each stopkey may be provided with a second touch common to organ practice which is used temporarily to make its circuit individually active and not subject to a master.

Referring now to Fig. 2 there is shown in front elevation a dimmer control panel which houses dimmer control potentiometer units similar to the control potentiometers 1 and 3 of Fig. 1, for a typical installation according to the invention.

The control panel comprises a floor-standing dimmer wing in which are mounted the aforesaid control potentiometer units each of which is actuated by a lever movable over a translucent arcuate graduated scale and the potentiometer units are arranged in alternate rows of white preset units 18 and green preset units 19. Each row is divided into two sections by a central vertical strip 20. The top row of potentiometer units have actuating levers 18*a* with black knobs (the white preset) while the next row of potentiometer units have levers 19*a* with green knobs (the green preset). The third row again has black knobs and

the fourth, green, and so on down the dimmer wing.

The number of each particular channel is carried on a prominent strip 21 between each two presets, allowing for rapid identification of a required channel.

The scales 22 of each control potentiometer have markings upon them running from 0 at the bottom to 10 at the top, and the particular level of any of the levers appears in view above the lower section of the knob which overrides the scale.

Each scale 22 is resiliently mounted on its unit and when pressed, causes a micro-switch within the unit to make contact for as long as the scale is pressed, and is concerned with channel selection. There are two display pilot lamps inside each scale, a white one at the top, and a red one at the bottom, for the purpose hereinafter described.

Fig. 3 shows in front elevation the master and memory panel associated with the dimmer control panel of Fig. 2 and houses four master potentiometers each with its operating lever moving over a graduated scale. The said master potentiometers are arranged in pairs and comprise a white preset master 23 having a black operating lever 23*a* moving over a red scale 23*b*, a white park master 24 having a black operating lever 24*a* moving over a white scale 24*b*, a green park master 25 having a green operating lever 25*a* moving over a white scale 25*b*, and a green preset master 26 having a green lever 26*a* moving over a red scale 26*b*. Each pair of potentiometers 23, 24 or 25 and 26 correspond to the master potentiometers 5 and 7 of Fig. 1.

Positioned above and below each master potentiometer is a push switch 27 corresponding to the push buttons 9 of Fig. 1, the push switches 27 above the respective potentiometers serving to transfer channels or groups of channels of the corresponding preset from one master potentiometer to the other, and the push switches below the potentiometers serving to remove channels or groups of channels from the respective master potentiometers.

In the upper portion of the master and memory panel are three tablet switches 30, 31 and 32. The switch 30 is labelled "reverse" and is used for channel selection. The switch 31 is labelled "park-trip" and is concerned with transferring individual channels from and into the parked condition. Switch 32 is the "dead blackout" switch and enables the operator to black the stage or studio out when lighting is not required such as, for example, during intervals.

At each side of the master and memory panel is a column of memory buttons in the form of luminous pushes, one column of buttons 35 being associated with the white preset and the other column of buttons 36 being associated with the green preset. In addition there is provided a single luminous button 37 which is employed to select the additive or subtractive action of the memories. The buttons 35 and 36 are used to store and recall selections of channels on either of the presets, while the button 37 enables a new selection to be added to a previous selection, or in the case of subtractive action to replace the previous selection.

The condition of the preset and park master potentiometers is indicated on two pairs of illuminated panels 38 and 39 positioned respectively in the middle of the two top rows of dimmer units (Fig. 2). The panels 38 of each pair are illuminated in correspondence to the positioning of the white park and green park master potentiometers 24 and 25 respectively while the panels 39 of each pair are illuminated in correspondence with the positioning of the white preset and green preset master potentiometers 23 and 26. The illumination of the panels 38 and 39 varies in accordance with the position of the levers of the master potentiometers and the conditions of the master potentiometers can thus be seen at a glance.

The operation of the apparatus will now be described with reference to the circuit diagram of Figure 4 illustrating the electrical connections of the four master potentiometers and one each of the white preset and green preset control potentiometers. It will be understood that the connections extending at the right hand side of Figure 4 are multipled with other white and green preset control potentiometers and associated selector relay units.

Before commencing operation, the four push switches 27 below the respective master potentiometers are actuated to ensure that there are no channels selected. The two park master levers 24*a* and 25*a* are moved to the "full on" position and the two preset master levers 23*a* and 26*a* remain at the "out" or off position. The illuminated panels 38 will now be fully illuminated indicating that the park master potentiometers are in the full on position, while the panels 39 will be extinguished indicating that the preset master potentiometers are in the off position.

In order to select a desired dimmer channel, for example the channel A controlled by potentiometer 18, the reverse switch 30 is actuated and the scale 22 of the potentiometer is momentarily depressed. The switch 30 energises a relay 40, and the corresponding contact 41 in turn energises another relay 42. The contact 43 of relay 42 completes the circuit from the micro-switch in the potentiometer

to the coil of a relay 52. Contact 41 also energises a relay 45, which at its contact 45*a* completes a similar path from the control potentiometer 19 to the relay unit 44. When the scale of the potentiometer is depressed the microswitch acts to energise the relay 52, and its contact 53 energises both a red lamp 46 in the potentiometer 18 and a relay in the unit 44. The construction of the relay 52 is such that it remains in its "energised" condition until pulsed again. Thus, even when the switch 30 and the microswitch are released, the lamp 46 remains illuminated and the relay in unit 44 remains energised. During energisation of the unit 44, potentiometer 18 is connected to preset master 23.

In a similar manner, other white preset control potentiometers may be selected, and all the selected potentiometers will be identified by a red pilot lamp and will be connected to the preset master 23. The preset master 23 can now be raised from its zero setting, and the stage lamps controlled by the dimmers corresponding to the selected potentiometers will become illuminated. As the white preset master potentiometer 23 is moved from its off position the panel 39 in the top row of white preset control potentiometers 18 will become increasingly illuminated to indicate the condition of the master potentiometers 23.

The required green preset control potentiometers 19 are then selected for control by the green preset master potentiometer 26 in a manner similar to that described above for the white preset.

When it is required to park the group of selected control potentiometers, for example, the white preset potentiometers 18 in order to enable the fresh selection to be made, the push switch 27 above the white park master potentiometer 24 is actuated.

Actuation of the switch 27 energises a relay 51, causing the contact 54 of the latter to close. The closing of the contact 54 has two effects, firstly to energise the relay unit 44 to establish a connection between the control potentiometer 18 and the park master potentiometer 24, and secondly, via the diode connected to the fixed contact 54, to cause de-selection of all the relays 52 which had previously been selected. The red lamps 46 are therefore extinguished while the relay unit 44 causes corresponding white lamps 55 to illuminate the upper part of each parked potentiometer scale. When the parking operation is completed the white preset master potentiometer 23 can then be used for a further selection of white preset potentiometers 18 as described above. After such further selection all the parked potentiometers 18 will have their scales illuminated by corresponding white lamps 55 and the newly selected potentiometers will have their scales illuminated by red lamps 46. The newly selected potentiometers are parked by again pushing the switch 27.

If it is required to park a single "selected" potentiometer 18 from a number of selected potentiometers the switch 31 is moved to its "park" position and the "reverse" switch 30 is depressed prior to depressing the scale of the appropriate potentiometer. Operation of the switches 30 and 31 causes closure of relay contacts 43 and 50, thus preparing for de-selection by the relay 52 and parking switching by the relay unit 44. When the potentiometer scale is depressed both these operations occur and the appropriate potentiometer is therefore transferred from master potentiometer 23 to park master potentiometer 24. This operation causes no transfer of any other of the previously selected potentiometers since the scales of these have not been depressed. The de-selection by relay 52 and parking operation of relay unit 44 cause the desired change from red lamp 46 to white lamp 55. The park relay contact 48 also completes preliminary switching for the green preset potentiometer 19.

In order to return a parked group of control potentiometers to the preset master control potentiometer, the control potentiometers are first selected in the manner previously described and the red lamps of the respective scales will become illuminated in addition to the white lamps which are already illuminated. Upon operating the push switch 27 above the white preset master control potentiometer 23, the coil of a "deparking" relay 60 is energised and over its contact 61 and through the relay unit 44 disconnects the control potentiometer from the park master potentiometer and reconnects it to the preset master potentiometer. At the same time the white lamp 55 is extinguished, the red lamp 46 remaining illuminated to indicate that the control potentiometer is selected and is connected to the preset master potentiometer.

If it is required to de-park an individual preset potentiometer the switch 30 is depressed and the switch 31 moved to its "trip" position prior to depressing the scale of the chosen potentiometer. Operation of the switch 30 causes actuation of relay contact 43, and operation of the switch 31 causes actuation of relay 56, the contact 57 of which energises relay coil 58 which in turn closes relay contact 59. In this way circuits are prepared to cause "selection" in the relay unit 44 to connect the potentiometer 18 to the white preset master potentiometer 23 and also to cause "deparking" in relay unit 44 to disconnect potentiometer 18 from the park master potentiometer 24. When the chosen poten-

tiometer scale is depressed, the selection and de-parking takes place and the preset potentiometer is transferred from the park master potentiometer 24 to the preset master potentiometer 23, the white lamp 55 being extinguished and the red lamp 46 being illuminated. The remaining parked potentiometers are not affected since their scales have not been depressed. In addition to the energisation of relay 58, the relay 58*a* is energised to provide similar preparatory connections for the green preset potentiometer 19.

When it is required to blackout the selected channels which may be under the control of the preset master potentiometer or the park master potentiometer, the push switch 27 below the respective master potentiometer is actuated to energise relay coil 62 or 62*a* which closes the respective contact 63 or 63*a* to cause actuation of the relay unit 44 which disconnects the selected control potentiometers so that the associated dimmer channels are blacked out.

The connections of the memory buttons 35 and 36 are not shown in Figure 4, but it will be understood that these buttons serve in known manner to connect the selected white or green preset control potentiometers to a memory store so that a given selection can be stored and can be brought into operation again when required by suitable operation of the memory buttons.

WHAT WE CLAIM IS:—

1. Apparatus for controlling lighting to produce a variable effect comprising a plurality of control potentiometers each of which controls the setting of a dimmer of one of a plurality of lighting circuits, a master control potentiometer and means for connecting any selected number of the control potentiometers to the master control potentiometer and for subsequently simultaneously transferring the potentiometers so selected to an alternative source of current leaving the master control potentiometer available for connection of further control potentiometers.

2. Apparatus as claimed in Claim 1 in which the alternative source of current is a further master control potentiometer.

3. Apparatus for the control of lighting for variable effect comprising a plurality of lighting circuits, a corresponding dimmer for each circuit, a corresponding preset control potentiometer adapted to control the setting of each dimmer, a preset master potentiometer, a park master potentiometer, relay means for connecting any selected number of the preset control potentiometers to the preset master potentiometer, and means for simultaneously transferring to the park master potentiometer all the preset control potentiometers so selected.

4. Apparatus as claimed in Claim 3 and further including a plurality of second preset control potentiometers each connected to a corresponding first-mentioned preset control potentiometer for controlling the setting of the associated dimmer, a second preset master potentiometer, a second park master potentiometer, further relay means for connecting any selected number of the second preset control potentiometers to the second preset master potentiometer and means for simultaneously transferring to the second park master potentiometer all the second preset control potentiometers so selected.

5. Apparatus as claimed in Claim 3 or Claim 4 in which each control potentiometer includes means giving a visual indication when the potentiometer is selected and when the potentiometer is parked.

6. Apparatus as claimed in any one of Claims 3—5 in which each control potentiometer is actuated by a lever moving over a graduated scale which is mounted movably for actuation of switch contacts connected in an operating circuit for the relay means.

7. Apparatus for the control of lighting for variable effect substantially as described with reference to and as illustrated by Figures 2, 3 and 4 of the accompanying drawings.

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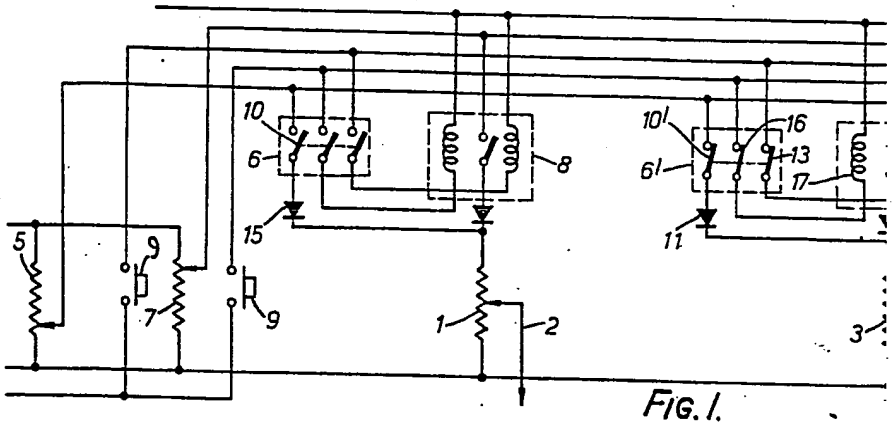
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FIG. 1.

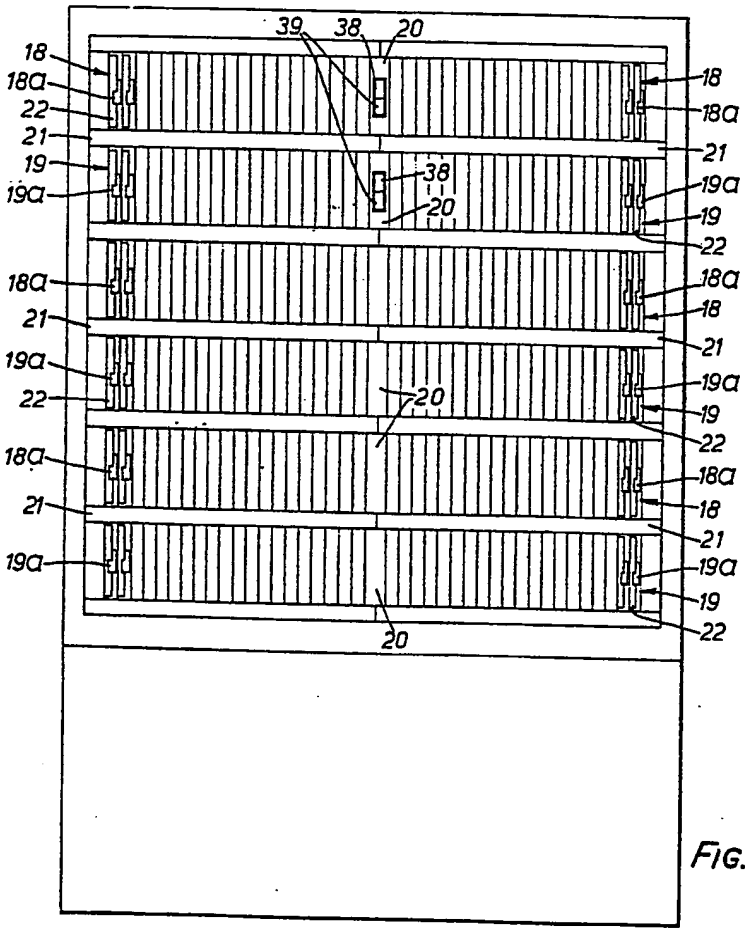
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FIG. 2.

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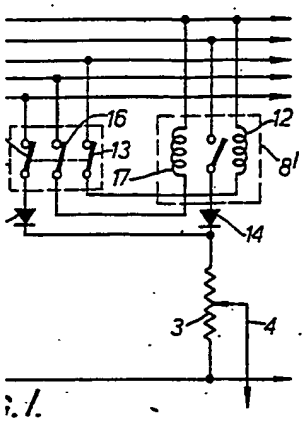

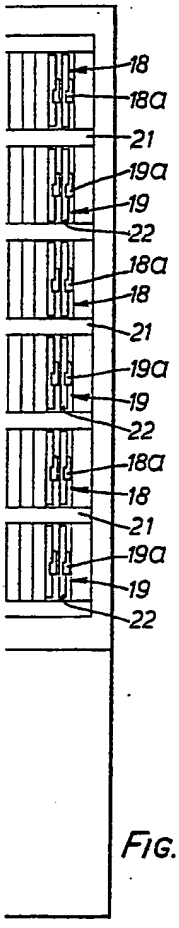

FIG. 2.

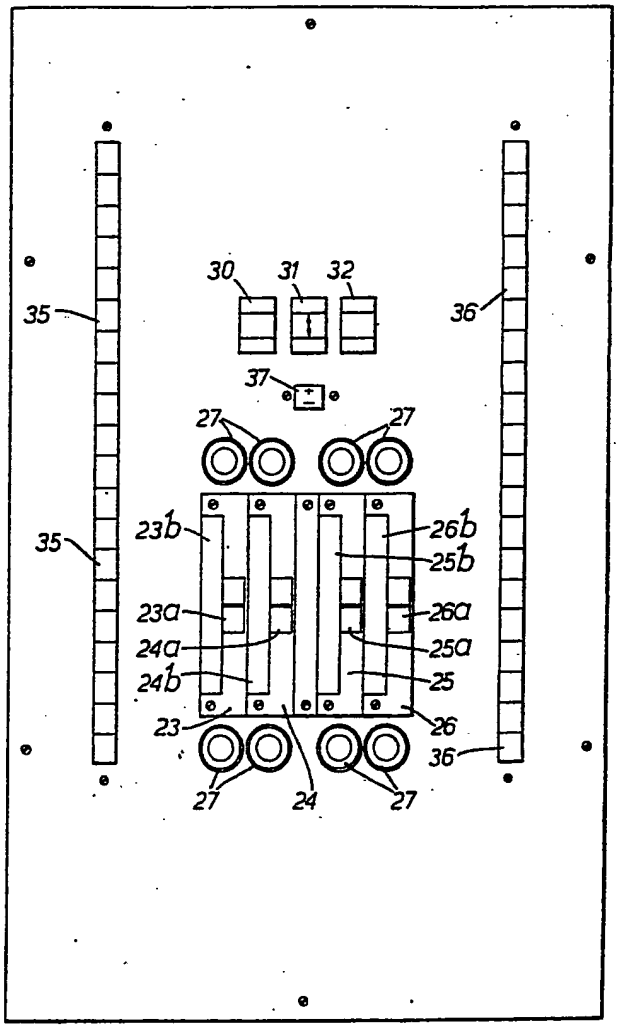

FIG. 3.

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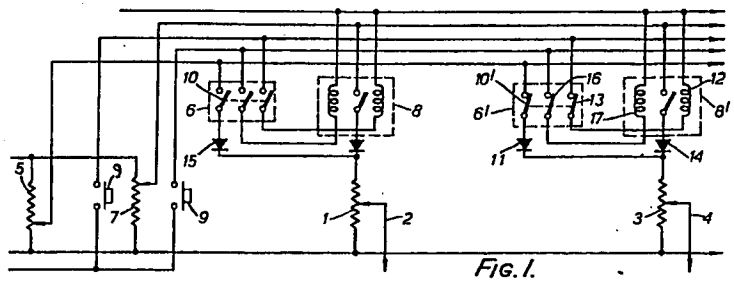

FIG. 1.

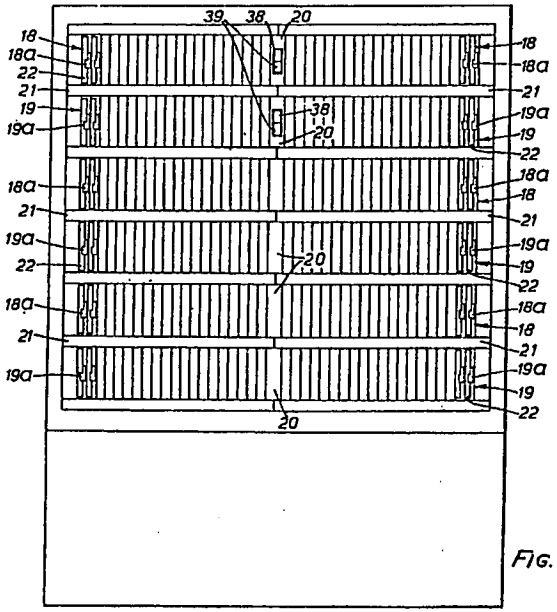

FIG. 2.

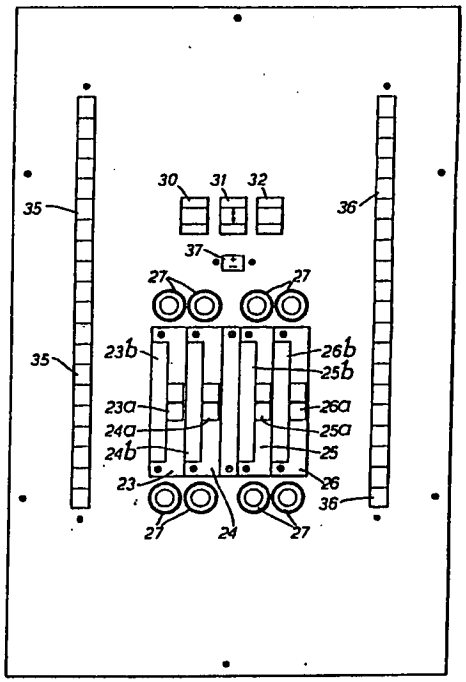

FIG. 3.

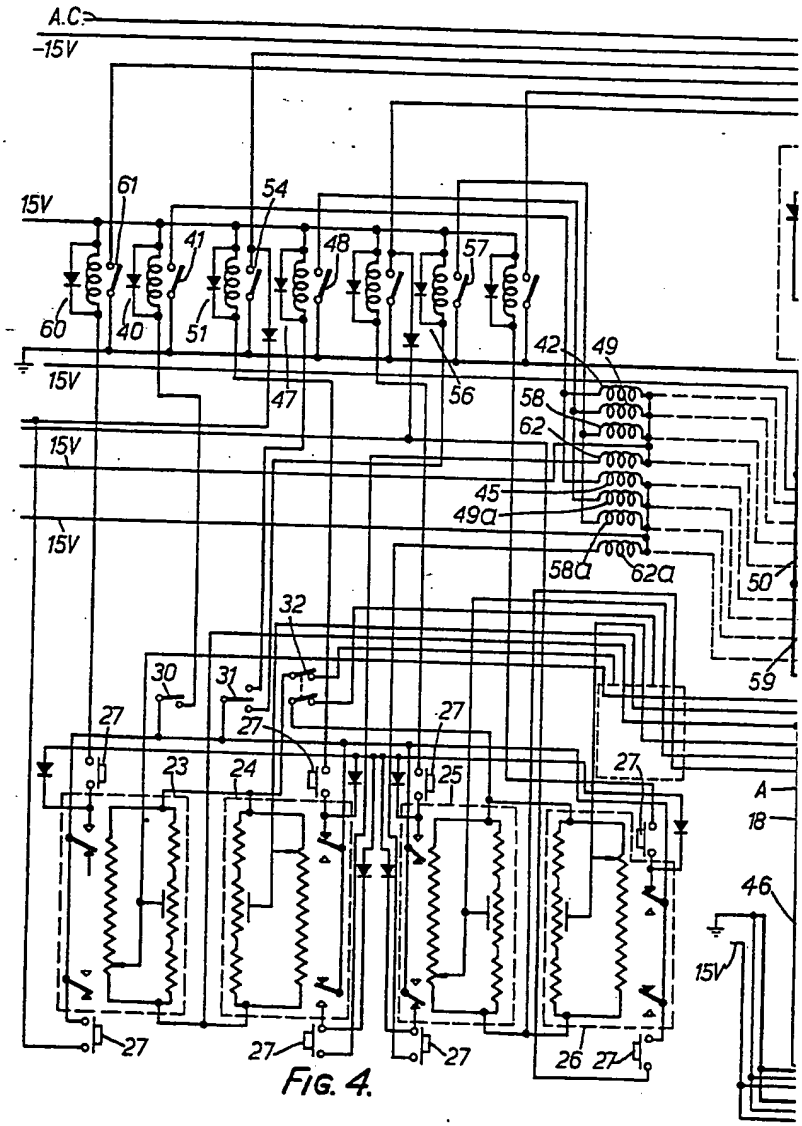
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FIG. 4.

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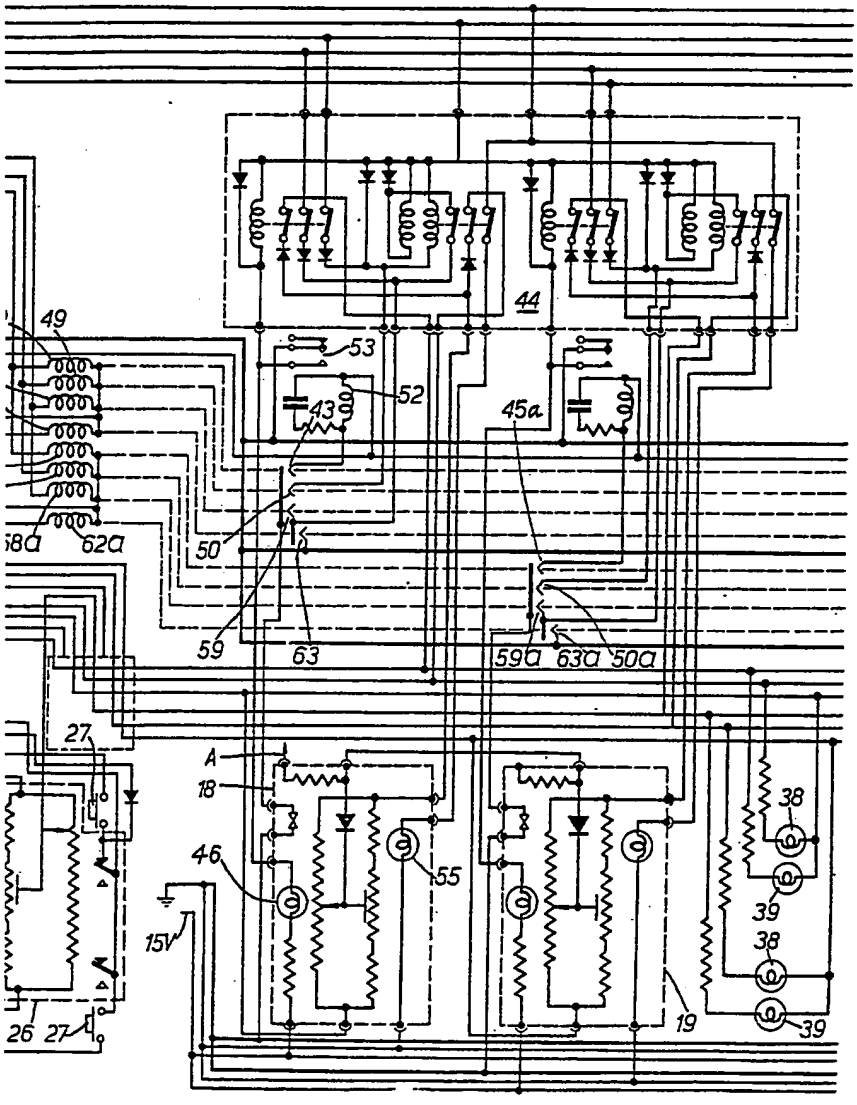
Sheet 2



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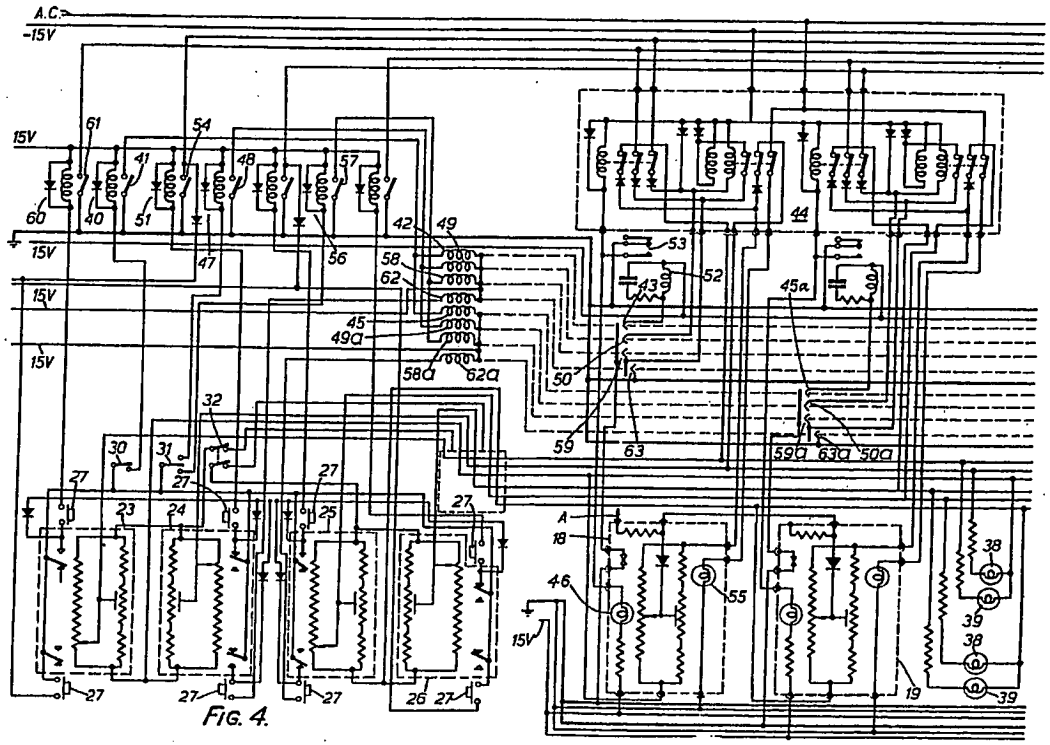

FIG. 4.